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Articles on Collaborative Public Management

What Do We Know and Need to Know about the Environmental Outcomes of Collaborative Management?

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Many tout the benefits of collaborative environmental management as an alternative to centralized planning and command and control regulation, but the excitement over collaborative processes has not been matched by evidence that these processes actually improve the environment. The most crucial question in collaborative environmental management remains unanswered and often unasked: To what extent does collaboration lead to improved environmental outcomes? We know much about why collaboration is occurring and how collaborative processes and outputs vary. The primary goal of future research on collaborative environmental management should be to demonstrate whether collaboration improves environmental conditions more than traditional processes and newer market-based processes. Collaboration is not a panacea; it is a choice that policy makers and public managers should make based on evidence about expected outcomes.

If the 20th century was the era of the administrative state, then the 21st century may be the era of the collaborative state. This seems particularly true for environmental issues, where decision-making processes have increasingly shifted from public hierarchies to multisector collaborative arrangements. As the number and types of collaborative activities have grown since the 1990s, so have the challenges of understanding the design, management, and performance of collaborative arrangements. Yet despite the growth of scholarship on collaborative management, we know little about the impact of collaboration on the environment. Many tout the benefits of collaboration as an alternative to hierarchy and regulation, but the excitement over collaborative processes has not been matched by evidence that collaboration has actually improved the environment. From our perspective, the most crucial question in collaborative environmental management remains unanswered and, all too often, unasked: *To what extent does collaboration lead to improved environmental outcomes?*

A significant knowledge gap persists regarding whether collaboration improves (or worsens) environmental conditions. This gap is especially troublesome because governments at all levels are making substantial and increasing investments in collaborative environmental management without the knowledge to measure and understand the effectiveness of these efforts. We know much about why collaboration is occurring and how collaborative processes (such as consensus) and outputs (such as agreements) vary. We need to know much more about outcomes.

In the following sections, we review the state of knowledge on collaborative environmental management and present a research agenda for the future. Because much is now known about collaborative processes, we argue that research efforts should shift to focus on analyzing the effects of collaboration on environmental outcomes. The primary goal of future research on collaborative environmental management should be to demonstrate whether collaborative processes enhance environmental performance more than traditional processes (such as hierarchical planning and command and control regulation) and more than newer market-based processes (such as permit trading). Collaboration is not a panacea; it is a choice that policy makers and public managers should make based on evidence about expected outcomes. As we enter the era of the collaborative state, we must buttress the enthusiasm for collaboration with a better understanding of its environmental impacts.

The Growth of Collaborative Environmental Management

The rise of collaborative environmental management is a reflection of changing environmental and social conditions. Many environmental problems are not amenable to central government solutions. Declining salmon runs in the Pacific Northwest, hypoxia in the Gulf of Mexico, depleted aquifers in the western United States, habitat loss in the face of development, urban sprawl across agricultural landscapes, and air pollution are just a few of the challenges that have resulted from the independent actions of thousands or even millions of decision makers (Bidwell and Ryan 2006; Colvile

et al. 2001; Lubick and Sever 2004; Rabalais, Turner, and Scavia 2002; Squires 2002; Thomas 2003a). The emergence of nonpoint source pollution as a primary contributor to environmental degradation has led many to conclude that centralized, federally controlled efforts are insufficient to solve many environmental problems (Durant, Fiorino, and O'Leary 2004; John 1994). Social conditions, including changing expectations about citizens' roles in policy making, have also contributed to the rise of collaboration. Trust in the ability of government agency experts to take action independent of citizen demands has been replaced by significant distrust and efforts to increase stakeholder involvement in policy making (Cortner and Moote 1999).

In the 1990s, collaborative environmental management took center stage in the United States. The U.S. Environmental Protection Agency (EPA) began its Community-Based Environmental Program, the U.S. Forest Service emphasized collaborative planning with stakeholders, and 18 federal agencies that manage land adopted ecosystem management approaches that featured collaboration as a central tenet (Carr, Selin, and Schuett 1998; Morrissey, Zinn, and Corn 1994). In 2000, the Secretaries of the Interior and Agriculture announced a watershed-based approach for land and resource management, calling for agencies within their departments to collaborate with state and local governments, citizens, and interest groups (USDA and USDOC 2000).

As federal and state environmental policies shifted toward collaborative approaches, grassroots groups of diverse stakeholders organized to focus on local environmental conditions (Brick and Weber 2001; Moore 2001; Sabatier et al. 2005; Yaffee et al. 1996). Although collaborative environmental management is often described as a grassroots or bottom-up approach (Snow 2001; Weber 2003), government actors and institutions have played a wide variety of roles in fostering and impeding these grassroots efforts (Koontz et al. 2004; Thomas 2003a). The decision to collaborate (or not) and to encourage collaboration (or not) represents a strategic choice by public officials to achieve specific goals, and there are a variety of ways for government to participate in collaborative efforts to achieve these goals.

Many seemingly grassroots initiatives have garnered substantial public funding. This funding has come largely from the EPA, federal land management agencies (such as the Forest Service, the Bureau of Land Management, and the Fish and Wildlife Service), and state governments. For example, the EPA's Section 319 grant program under the Clean Water Act provides funding to local watershed organizations to develop management plans for their watersheds, emphasizing collaborative, community-based management approaches that use a watershed scale (Davenport et al. 1996). In 2004, the EPA distributed more than $42 million in Section 319 funds through a single regional office (Region 5), indicating the magnitude of just this one program.

Many state governments have also supported collaborative efforts, especially for watersheds. States have provided collaborative watershed partnerships with resources such as funding, technical assistance, and personnel (Bidwell and Ryan 2006; Collins et al. 1998; Nikolic 2005; Ryan and Klug 2003; Steelman and Carmin 2002). For example, the Ohio Environmental Protection Agency and Ohio Department of Natural Resources expended nearly $1 million on a multiyear competitive grant program that aims to improve surface water quality through community-based collaborative watershed planning and management. This program, the Ohio Watershed Coordinator Grant Program, provided grant recipients with funding for personnel as well as technical assistance (Nikolic 2005).

State and federal collaborative efforts have also targeted other environmental issues, such as marine resources and pollution control. The National Oceanic and Atmospheric Administration, through its Community-Based Restoration Program, provides seed money and technical resources to support grassroots efforts to restore fishery habitats. At the state level, the California Marine Life Protection Act required the California Department of Fish and Game to develop a plan to improve marine protected areas along the coast. Public outrage over the original plan, developed largely by scientists, led the agency to start regional collaborative processes involving all stakeholders (Weible and Sabatier 2005). Federal/state collaborations through the National Estuary Program have also encouraged collaboration among a variety of stakeholders to develop science-based plans for estuaries (Korfmacher 1998; Lubell 2004). In the area of pollution control, the EPA has used a collaborative regulatory negotiation process for some pollution regulations. For example, the EPA led a collaborative effort that reached an agreement among industry, environmental interests, and federal and state government regulators in 1991 on reformulated gasoline in smog-laden urban areas (Weber 1998).

In sum, collaboration has spread across the spectrum of environmental issues, from the management of terrestrial and aquatic resources to pollution control. The extent of collaboration is well documented. In the next section, we will demonstrate that much is also known about how collaborative processes work in practice.

Evaluating Collaborative Environmental Management as a Process

The literature on collaborative environmental management primarily focuses on process. This is not surprising given collaboration's roots in alternative dispute

resolution, which focuses on mediation, negotiation, and the building of agreements among competing stakeholders (Snow 2001, 3). Numerous case studies and large-*N* statistical analyses of collaborative processes have been published since 1990. This literature covers a broad range of topics, from normative statements about the desirability of collaboration to empirical descriptions of different types of collaborative processes, to causal arguments explaining the cohesiveness and longevity of collaborative efforts. Before addressing environmental outcomes, it is useful to review what is already known about collaborative processes, as this literature provides the foundation for future work to evaluate the impact of collaboration on the environment.

From a normative perspective, proponents of collaborative environmental management argue that it is a healthy response to policy gridlock and litigation grounded in interest group pluralism (Kemmis 1990; Snow 2001), that collaboration leads to better decisions (Wondolleck and Yaffee 2000), that collaboration can lead to effective and equitable solutions while increasing citizens' capacity for self-governance (Fung and Wright 2001), and that community-based collaboration is more democratically accountable than traditional adversarial approaches (Weber 2003). In contrast, opponents argue that collaborative efforts favoring place-based stakeholders disenfranchise stakeholders who favor environmental protection (McCloskey 1996), that collaborative processes relying on consensus do not ensure better decisions (Coglianese 1999), and that collaboration might reinforce existing power disparities rather than promote diverse stakeholder inclusion (Abel and Stephan 2000; Bidwell and Ryan 2006). Much empirical research is still needed to resolve these significant normative disagreements about the impacts of collaborative environmental management.

Large-*N* empirical studies have found great variation in collaborative processes in a wide variety of settings (e.g., Coughlin et al. 1999; Kenney 1997; Yaffee et al. 1996). A nationwide survey of collaborative watershed partnerships, for example, revealed important regional differences in collaborative partnership membership, issue focus, and organizational structures (Clark, Burkardt, and King 2005). This empirical variation suggests ample opportunities to design research studies linking collaborative processes to environmental outcomes. Much has also been written about the causal factors that hold collaborative groups together. This work has become increasingly sophisticated, testing competing hypotheses from multiple theories, both in small-*N* (Heikkila and Gerlak 2005) and large-*N* research (Leach and Sabatier 2005b). The great wealth of descriptive studies and increasing growth in causal studies of collaborative processes suggests the field is now ripe to move on to the effects of process on environmental outcomes.

Evaluating the Outcomes of Collaborative Environmental Management

Following the lead of policy scholars, we distinguish between outputs and outcomes. Outputs are the plans, projects, and other tangible items generated by collaborative efforts. Outcomes are the effects of outputs on environmental and social conditions. This distinction suggests two basic research questions regarding the performance of collaborative efforts:

1. Do collaborative processes produce different outputs than noncollaborative processes?
2. Do collaborative outputs produce better environmental and social outcomes?

These questions lead us to ask, for example, whether a collaborative land management plan looks different from a plan produced within an agency hierarchy and, if so, whether this plan better protects species or improves local economies.

Existing research has measured and compared collaborative outputs, but relatively little research has linked outputs with outcomes. The notable exception is social outcomes, as scholars have recently demonstrated that successful collaborative efforts lead to increased trust and social capital (Leach and Sabatier 2005a; Lubell 2005). We argue, however, that the success of collaborative environmental management should be measured primarily in terms of environmental outcomes. Although social outcomes certainly matter, we focus on environmental outcomes in this article, for two reasons. First, as we have already noted, much work remains to be done on this topic. Second, for reasons we will note later, it is more difficult to make causal inferences about the effects of collaborative processes on environmental outcomes than it is to make inferences about the effects on social outcomes. Our focus on environmental outcomes is not meant, however, to diminish the importance of social outcomes. Not only do social outcomes have obvious implications for human lives, we can likely generalize the findings of research on the social outcomes of collaborative environmental management to other issue areas. Moreover, it is possible that environmental and social outcomes might be inversely related—that is, collaboration might improve social conditions while worsening environmental conditions. This would make the choice of collaboration—over hierarchy, regulation, or market mechanisms—that much more difficult.

Research Challenges in Studying Environmental Outcomes

It is difficult to link management processes (regardless of whether they are collaborative) to environmental outcomes. The most notable challenges include (1) gathering data that measures environmental outcomes, (2) allowing for long time horizons between the implementation of collaborative outputs and

environmental change, and (3) designing research protocols that untangle the effects of multiple interacting variables that shape environmental change.

Data availability is the first research challenge—we cannot make claims about the environmental impacts of collaboration without data that measures changes in environmental conditions. Unfortunately, few collaborative groups monitor the environmental conditions associated with their activities. Rather than developing indicators of environmental outcomes, they usually focus on outputs (such as plans, projects, management practices, and policies) because outputs are more easily measured. For example, watershed group leaders in Ohio measured group success primarily in terms of group development and maintenance, education and outreach activities, increased public awareness, networking, plan development, and public policy change (Koontz and Johnson 2004). At the national level, researchers evaluating habitat conservation plans prepared under the Endangered Species Act found that only 7 of 43 plans in their sample—just 16 percent—contained monitoring programs sufficient for evaluating environmental outcomes (Kareiva et al. 1999). Though it might be tempting to use habitat conservation plans to analyze the impact of collaboration on environmental outcomes because they vary widely on several dimensions of collaboration, few habitat conservation plans contain sufficient monitoring programs, and it remains unknown how many monitoring programs in those plans have actually been implemented (Thomas 2003b). These findings are consistent with more general studies demonstrating that practitioners measure outputs more often than outcomes (Ingraham, Joyce, and Donahue 2003, 87–96). Why this occurs is unclear, but it is likely the result of limited funding to measure outcomes and limited requirements to do so.

A second research challenge is the long time horizon required between the implementation of collaborative outputs and environmental change. Measures of environmental outcomes must begin before a collaborative output is implemented and extend for years (if not decades) to allow for environmental conditions to change as a result of the output. The longer the time series, the better able we are to infer that environmental conditions changed as a result of collaborative outputs. The shorter the time series, the weaker our causal claims—as demonstrated by Campbell and Ross (1968) in their venerable study of the Connecticut crackdown on speeding. If monitoring programs are implemented only after a collaborative plan is developed, causal inferences regarding the effects of collaboration are significantly weakened.

A third research challenge involves disentangling the multiple interacting variables that shape environmental conditions. Even if we have valid and reliable measures of environmental conditions gathered in a long time series that predates implementation of collaborative outputs, we must still demonstrate the extent to which collaborative outputs (rather than other factors) changed environmental conditions. The ideal research design would be a natural experiment with multiple cases. An exemplar in this regard is *Making Democracy Work* (Putnam 1993), which explores how social outputs and outcomes differed across regions of Italy after similar institutions were established simultaneously in each region. Another approach would be to find cases with similar background conditions but differing institutional processes.

Though single case studies can be used to explore causal mechanisms (George and Bennett 2005), a hypothetical example illustrates how difficult it is to isolate the effects of collaborative outputs from other causal mechanisms within a single case study. Assume that a collaborative group completes an educational campaign that targets fertilizer use on lawns near one stretch of a river. Also assume that data exist to compare phosphorous levels before and after the intervention. Can we isolate lawn runoff from other sources of phosphorous in the river? Did storm events flush more or less phosphorous than usual from the land? Was the measured phosphorous a residual from the years prior to the educational campaign? As one scientist explains, "Work on nonpoint sources is by nature incremental. What you can measure at any point on the stream represents the sum of everything that happens, good or bad, upstream and upslope. You can't have measurable impact on the health of a stream draining 100 square miles by fixing a quarter-mile of bank" (reported in Born and Genskow 2000, 43).

To further complicate matters, collaborative watershed groups often engage in activities that improve environmental conditions only indirectly. For example, Korfmacher (2000) describes a case in which a partnership did not implement group projects to enhance water quality; instead, government officials in the partnership carried a new perspective back to their agencies that led them to conduct their work in more environmentally protective ways. Similarly, watershed groups may press for changes to public policy that they hope will, in turn, lead to improved environmental conditions, such as new zoning ordinances, development standards, project funding, or stream use designations (Fleishman and Koontz 2004).

Existing Measures

Existing research on collaborative environmental management suggests several useful measures of environmental outputs and outcomes (table 1). Although our concern is with environmental outcomes, collaborative outputs cannot be ignored because they are the

Table 1 Existing Measures of Environmental Outputs and Outcomes

Measures	Data-Collection Methods
Environmental Outputs	
Agreements reached (e.g., management plans and characterization reports)	Group surveys and interviews; document analysis
Restoration or habitat improvement projects completed (e.g., restoration of vegetation, morphology, or biota; trash removed)	Group surveys and interviews; document analysis
Changes to public policy	Group surveys and interviews; government official interviews
Changes to land management practices (e.g., best management practices adopted)	Group surveys and interviews; landowner surveys
Education and outreach campaigns conducted	Group surveys and interviews; document analysis
Programs implemented (e.g., total maximum daily load programs)	Group surveys and interviews; document analysis; government official interviews
Land protected from development (e.g., new regulations, land/easement purchases, or special designations)	Group surveys and interviews; document analysis; government official interviews
Environmental Outcomes	
Perceptions of changes in environmental quality	Group surveys and interviews
Changes in land cover	Remote sensing
Changes in biological diversity (at the genetic, species, or landscape levels)	Ecological studies
Changes in environmental parameters appropriate to a specific resource (e.g., water biochemical oxygen demand, ambient pollution levels, or contaminant discharge rates)	Ecological studies

Sources: Born and Genskow (2000); Conley and Moote (2003); Imperial (1999); Koontz and Johnson (2004); Koontz et al. (2004); Leach, Pelkey, and Sabatier (2002); Schweik and Thomas (2002); Yaffee et al. (1996).

intermediary causal mechanisms between collaborative processes and collaborative outcomes. Table 1 identifies many more existing measures of outputs than outcomes, presumably because outputs are relatively easy to measure.

One tangible output is the attainment of agreements among diverse stakeholders. Many collaborative efforts focus on generating agreements, often in the form of comprehensive plans or reports. Researchers have measured both the number of collaborative agreements reached, as well as the contents of those agreements (Conroy and Berke 2004; Kareiva et al. 1999; Koontz 2003; Leach and Sabatier 2005a). Funding agencies sometimes condition the allocation of resources on the creation of collaborative management plans, in the hope that plans will yield environmental change (U.S. EPA 1993). Another form of agreement is characterization reports, which can bring appropriate scientific and other information to bear on their work.

Agreements are presumably a precursor to meaningful action, but reaching agreement does not always lead to projects that improve the environment. Hence, we need to measure actual activities, not just agreements. Leach and Sabatier (2005a), for example, develop a quantitative index to measure restoration projects completed by collaborative watershed groups, taking into account the level of implementation, geographic scope, and whether the project would have occurred as soon without the group's efforts.

Besides direct action, collaborative partnerships may attempt to enhance environmental quality indirectly through the actions of others. A commonly measured output is the range of effort that a collaborative partnership undertakes to induce behavioral changes on the part of policy makers or other decision makers. For example, Koontz (2005) measured the degree to which collaborative land-use planning efforts led to local policy change. Lubell (2004) measured landowners' willingness to participate in conservation practices related to National Estuary Program collaborative efforts. Lawrence (2005) measured the stringency of storm water management plans submitted by local policy makers seeking discharge permits. Yaffee et al. (1996) measured the extent of educational and outreach campaigns to enhance environmental quality. Fleishman (2004) examined collaborative partnerships' role in facilitating implementation of government programs such as total maximum daily load reduction. Conley and Moote (2003) listed changed land management practices as a common criterion in their review of evaluative studies of collaborative efforts.

Environmental outcomes have been measured in several ways. Some researchers have examined participant perceptions of environmental improvements (Leach and Sabatier 2005a; Leach, Pelkey, and Sabatier 2002). Though intriguing, participant perception is an indirect measure of environmental improvement. Participant perceptions may also be biased in systematic ways. Participants who experience positive social interactions in a collaborative setting that builds

interpersonal trust have been shown to be systematically more positive about the environmental outcomes they attribute to the partnership. This so-called halo effect biases perceptions of environmental improvements upward (Leach and Sabatier 2005a). More generally, as Coglianese (2003) has argued, participant perceptions are skewed by cognitive dissonance effects: Individuals who participate in efforts that are more time- and labor- intensive (e.g., collaborative endeavors) exaggerate the positive outcomes of those efforts as a way to rationalize their participation. Thus, it is important to supplement indirect and subjective measures of participant perception with direct and objective measures of environmental conditions, particularly measures that have been developed and gathered by external monitors. The most appropriate measures of environmental conditions will vary across space and time (Brogden 2003). For example, Schweik and Thomas (2002) used remote-sensing data from satellites to measure changes in land cover before and after implementation of a habitat conservation plan, and Lawrence (2005) used ecological assessment data collected by the state EPA for particular streams dating back to the late 1970s.

As table 1 indicates, a wide variety of methods have been used to measure environmental outputs and outcomes. In general, interviews and surveys of collaborative partnership members can provide useful data for many output measures, as can analysis of documents (e.g., group reports, budgets, management plans, newsletters, educational materials). Outcome measures typically require other types of data. Although interviews and surveys can be used for perceptual measures of changing environmental conditions, they are less valid and reliable than direct measures. Ecological studies (on the ground) and remote sensing (from the sky) are more appropriate for measuring actual environmental conditions. In addition to the literature on collaborative environmental management, researchers can look more generally to the literature on environmental program evaluation and common-pool resource management for additional measures of environmental conditions (Bennear and Coglianese 2005; Gibson, McKean, and Ostrom 2000).

Envisioning a Research Agenda

Much is now known about the scope and practice of collaborative management, but little is known about the effects of collaboration on the environment. If the 21st century is to become the era of the collaborative state, scholars and practitioners need to know much more about the environmental impacts of collaborative processes. In this section, we develop a research agenda and invite other scholars and practitioners to contribute to it. We also bring social outcomes back into the discussion, reminding readers that environmental outcomes are not the only concern.

Key Questions to Be Answered

Collaboration is not a panacea for environmental management. Though some scholars and practitioners view collaboration as an end itself, we view collaboration as a means to an end. We believe the most crucial question regarding collaborative environmental management remains unanswered and often unasked: *To what extent does collaboration lead to improved environmental outcomes?* Answering this big question requires us to decompose it into a series of smaller questions:

- What are the outputs of collaborative processes?
- How do collaborative outputs differ from noncollaborative outputs?
- Do collaborative outputs produce different outcomes than noncollaborative outputs?
- Are collaborative outcomes systematic improvements over noncollaborative outcomes?

Existing research has made large strides in answering the first question, but much remains unknown about the other questions. In the remainder of this article, we suggest several ways in which practitioners and academics can work together to answer these important questions.

Role for Practitioners

By *practitioner,* we mean those who participate in or externally govern collaborative efforts. Some practitioners will be of greater assistance in studying environmental outcomes than others. Participants in collaborative efforts, as previously noted, tend to measure success in terms of outputs rather than outcomes; thus, we should not expect collaborative groups to produce useful indicators of environmental outcomes without guidance or resources. Public officials who fund or authorize collaborative efforts can require monitoring programs as a condition of funding or authorization. Another strategy is to provide technical assistance and funding earmarked for monitoring. Public officials can also establish uniform standards for these measures or develop their own measures and databases of relevant environmental conditions, both of which would facilitate subsequent cross-case comparisons. In this regard, we recommend that public officials work closely with academic researchers to develop measurement standards and databases so that outcome measures can be readily incorporated into research designs that test hypotheses linking collaborative processes with environmental outcomes.

Public officials can advance this research agenda in other regards. The most obvious recommendation is to fund research on environmental outcomes, particularly because this has not been a priority of philanthropic organizations. Private foundations have been eager to fund collaborative efforts but not to fund research that evaluates the success of those efforts. Public officials can also help academic researchers gain

access to agency documents on collaborative processes. Even more important would be to treat collaboration as an experiment by setting up noncollaborative control groups for comparative purposes. Such management experimentation has been explored in the environmental arena under the concept of adaptive management (Holling 1978; Lee 1993; Walters 1997). Doing so would allow researchers to make much stronger causal claims about the relative impact of collaboration over noncollaborative processes.

Role for Academic Researchers

Academic researchers should not attempt to pursue these large research questions alone. Funding is only one issue. It is also important to work with practitioners to design and implement monitoring systems before collaborative outputs are implemented in order to set the stage for longitudinal, cross-sectional studies. In designing these measures, researchers should consider several types of research designs, as each is appropriate for testing different propositions. The simplest research design would demonstrate that collaboration leads to environmental improvement. This could be done with longitudinal case studies that measure environmental conditions before and after the implementation of collaborative outputs, along with process tracing and comparative methods to analyze the extent to which collaborative outputs are an important contributor to environmental improvements. This type of research design could support the minimal claim that collaboration does not harm the environment.

More ambitious research designs are needed to establish whether collaboration improves environmental conditions more than noncollaborative processes. The best research design for making causal inferences of this sort is an experiment in which different types of processes are randomly assigned to similar cases. Though natural experiments without random assignment might exist, they would provide less leverage for making causal inferences, and we would need comparable measures of environmental outcomes across cases. In fact, some state environmental protection agencies have collected water-quality data for different streams over time. But, if on-the-ground measures of ecological conditions do not exist prior to implementation, researchers should consider using remote sensing data to track environmental change. Schweik and Thomas (2002), for example, demonstrate that remote sensing can be used to evaluate the environmental outcomes of habitat conservation plans by linking the institutional features of a plan (collaborative outputs) to changes in land cover (environmental outcomes). The promise of remote-sensing analysis for studying environmental change is sufficiently great that the journal *Conservation Biology* devoted a special issue to this methodology in 2001. Landsat satellites have been taking multispectral, digital images of the same footprint every 16–18 days since 1972, which means that time-series observations pre-date the implementation of most collaborative outputs (and many noncollaborative outputs).

More ambitious research designs are needed to establish whether collaboration improves environmental conditions more than noncollaborative processes.

An even more ambitious research design would allow us to make inferences about whether collaboration works best in tandem with other processes. A recurring debate, for example, is whether collaboration is a substitute for regulation or whether regulation both precipitates collaboration and sets minimum performance standards. To test these competing hypotheses, we would need to set up experiments that allow one or more collaborative efforts to proceed in the absence of regulatory standards. This design might be politically difficult, however, as it would require waivers of regulatory standards for scientific purposes.

Social Outcomes

In closing, it is important to raise the issue of social outcomes again, though we do not have space to give them full consideration in this article. We have focused on environmental outcomes, but there are many types of social outcomes that also should be considered in a larger research agenda. These include trust, legitimacy, and social capital (the most studied outcomes thus far), as well as numerous economic conditions, such as the effects of collaboration on employment, personal income, government revenue, and so on. In privileging environmental outcomes, we do not seek to discount the importance of social outcomes or the need to study the links between collaborative processes and social outcomes, as is being done in other issue areas, such as human services (Page 2004). Not only do social outcomes such as improved trust and social capital provide the infrastructure for future collaborative efforts, social outcomes also matter because people's lives and livelihoods are at stake. Moreover, it is important to know whether social and environmental outcomes are inversely correlated. The future choices made by policy makers and public managers will be much more difficult if we discover, for example, that collaboration improves social conditions but worsens environmental conditions.

Conclusion

The use of collaborative public management to address environmental issues has grown tremendously over the past two decades. Governments at all levels have increasingly turned to collaboration, providing substantial resources to such efforts. Proponents have lauded this approach as a creative alternative to hierarchical

planning within agencies, command and control regulations, and litigious interest group pluralism. Opponents, meanwhile, have criticized collaboration over concerns about equity and decision quality.

Scholarship on collaborative environmental management has evolved to examine how different efforts play out in different contexts, with special emphasis on process characteristics (such as consensus, participation, and accountability) and outputs (such as agreements, plans, and projects). Although scholars have developed many variables for measuring process characteristics and policy outputs, much work remains to be done in order to link these variables with policy outcomes. Existing research on policy outcomes has focused primarily on social outcomes (such as trust and social capital), and a considerable gap remains in our understanding of the effect of process characteristics and policy outputs on environmental outcomes (such as changes in land cover, biological diversity, pollution, and other measures of environmental quality). This knowledge gap is largely attributable to the challenges of data availability, long time horizons, and untangling multiple interacting variables.

We believe that scholarship on collaborative environmental management must now be pushed in a new direction, with research designs specifically tailored to link process characteristics and policy outputs with environmental outcomes. At a minimum, we need to know whether collaboration improves or worsens environmental conditions. Better yet, we need to know which types of decision-making processes—multisector collaboration, hierarchical planning, command and control regulation, or market-based mechanisms—perform best in terms of environmental outcomes. It would be even better to know which combinations of these processes (e.g., regulations combined with collaboration) work best in different circumstances.

Public administrators, policy makers, and academic researchers can contribute to this endeavor in a variety of ways. Public officials can require and support monitoring programs, and they can establish uniform standards for measuring environmental conditions to allow for cross-case comparisons. They can also take a cue from the literature on adaptive management, which treats management activities as experiments designed to maximize learning, and establish collaborative efforts alongside noncollaborative control groups. Doing so would provide us with much more leverage for making causal inferences regarding the effects of process characteristics and policy outputs on environmental outcomes.

Researchers employing longitudinal studies, working in tandem with practitioners, can illuminate the links between collaborative outputs and environmental outcomes. Experimental and quasi-experimental studies using new and existing measures of process characteristics and policy outputs can compare collaborative to noncollaborative processes while using ecological studies (on the ground) or remote sensing data (from the sky) to measure changes in environmental conditions.

Our focus on environmental outcomes does not preclude the value of social outcomes. In a democratic society, governance also must be concerned with community well-being. Besides their inherent value, social outcomes might also be correlated with environmental outcomes. Yet regardless of social outcomes, in order for collaborative environmental management to be deemed a success, we must have a solid base of evidence that it improves—or at least does not worsen—environmental conditions when compared with other management approaches. In the absence of such knowledge, collaboration may do more environmental harm than good. Moreover, failure to establish evidence of environmental improvements might dissuade the use of collaboration in cases in which it could be effective.

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